

Capacity Building for SDIs

Ian P. Williamson¹ and Abbas Rajabifard²

Centre for Spatial Data Infrastructures and Land Administration
Department of Geomatics, The University of Melbourne, Victoria 3010, Australia

http://www.geom.unimelb.edu.au/research/SDI_research/

¹Email: ianpw@unimelb.edu.au, ²Email: abbas.r@unimelb.edu.au

and

Stig Enemark

Aalborg University, Denmark

Email: enemark@land.auc.dk

ABSTRACT

Capacity building is an essential component of any institutional reform such as building land administration infrastructures or spatial data infrastructures (SDI). However the capacity building concept is often used within a narrow meaning such as focusing on staff development through formal education and training programmes to meet the lack of qualified personnel in a project in the short term. This paper argues that capacity building measures should be addressed in the wider context of developing and maintaining institutional infrastructures in a sustainable way, even if the key focus may be on education and training to meet short and medium term needs.

This paper develops the capacity building concept and looks at capacity assessment and capacity development as the two key components. Within capacity development it considers the levels and dimensions of capacity.

The paper then introduces the evolving SDI concept and explores how capacity building is essential in delivering an operational SDI. In order to resolve the difficulty of applying the complex and often unclear nature of capacity building to the evolving and similarly unclear nature of SDI, capacity building for SDI in Australia is used as a case study.

The paper also identifies that the SDI concept is less easily transferred to developing countries and as such raises the role of SDIs in developing countries as an important un–answered question for the Permanent Committee on GIS Infrastructure for Asia and the Pacific to consider.

Key words: Capacity building; SDI; developing countries.

INTRODUCTION

In the information society evolving in developed countries, the “point and click” vision to provide access to both government and private data within a virtual world is almost upon us. Such a vision underpins e-commerce and good governance. It is generally understood that this vision is not possible without an SDI in place to support it, in a similar way that an effective road and rail infrastructure supports efficient transport. SDIs provide the spatial dimension which underpins the relationship of people to land. They provide the spatial information or the location component to support the systems that allow modern societies to operate and that allow both the natural and built environment to be modelled, understood and managed. All modern societies are developing sophisticated SDIs.

In most developing and transition countries there is a lack of institutional capacity to plan and develop SDI in an adequate and sustainable way. This is a similar situation when developing

land administration systems. SDI development in developing countries is usually undertaken by the international development community as part of a larger project which is responding to economic, social or environmental concerns. However, incorporating an SDI component in a project such as for land titling, irrigation or forestry is not simple. This is partly due to SDIs being removed from development issues such as poverty reduction or promotion of economic growth, because of the complex and theoretical nature of the SDI concept, and partly due to the lack of emphasis on long-term capacity building measures aimed at developing sustainable institutional infrastructures. To the authors' knowledge no developing country has instituted an SDI project as an entity – SDI projects are carried out as part of other projects and often are not identified as SDI components.

Due to the important role that SDIs play, there is a strong argument that they should be a central component of any development aid aimed at institution building in developing countries. The need for SDI is often identified during land administration projects but the need for an effective SDI is equally justified in a whole range of economic, environmental and social oriented projects in both an urban and rural context. An effective SDI ensures a whole-of-government approach to development assistance.

When a project is established to create a land administration infrastructures for example, often with the support of organisations such as The World Bank, United Nations agencies or individual country development assistance agencies, this paper argues that capacity building should be a mainstream component of the project. The capacity building aspect should be addressed up front, not as an add-on. In this context there are a whole range of capacity building and human resource development principles and options to be considered.

Capacity building is a complex issue. This article offers a conceptual understanding and some guiding principles when addressing capacity building for SDIs. For clarity it applies the concept to the SDI capacity building initiatives being undertaken in Australia and specifically by the Department of Geomatics and Centre for Spatial Data Infrastructures and Land Administration at The University of Melbourne as an example.

CAPACITY BUILDING

The term capacity has many different meanings and interpretations depending on who uses it and in what context it is used. It is generally accepted that capacity building as a concept is closely related to education, training and human resource development (HRD). This conventional concept has changed over recent years towards a broader and more holistic view, covering both institutional and country specific initiatives.

The Workshop on Capacity Building in Land Administration for Developing Countries, held at the ITC, The Netherlands, November 2000 (Groot and van der Molen 2000) adopted the following definition of capacity building: “*The development of knowledge, skills and attitudes in individuals and groups of people relevant in design, development, management and maintenance of institutional and operational infrastructures and processes that are locally meaningful*”. This is a broader approach while still focusing mainly on education, training and HRD.

It can be argued that the concept of capacity building should be viewed in a wider context to include the ways and means by which the overall goals in an activity or project are achieved. In the case of SDI, education, training and HRD may certainly be some of these means. However, development of institutional infrastructures (including issues such as good governance, decentralisation, and public participation) may be even more important. Also, the adoption of an adequate land policy framework may be the key to implementation. This paper argues that even if the key focus is on education and training to meet short and medium term project needs, capacity building measures should be assessed in the wider context of implementing spatial data policies in a sustainable way.

A recent UN publication on Capacity Assessment and Development (UNDP, 1998) offers this basic definition: “*Capacity can be defined as the ability of individuals and organizations or organizational units to perform functions effectively, efficiently and sustainably.*” This definition has three important aspects: (i) it indicates that capacity is not a passive state but is part of a continuing process; (ii) it ensures that human resources and the way in which they are utilized are central to capacity development; and (iii) it requires that the overall context within which organizations undertake their functions will also be a key consideration in strategies for capacity development. Capacity is the power of something – a system, an organisation or a person to perform and produce properly. In this UNDP publication, capacity is seen as two-dimensional: *Capacity Assessment and Capacity Development*.

Capacity Assessment or diagnosis is an essential basis for the formulation of coherent strategies for capacity development. This is a structured and analytical process whereby the various dimensions of capacity are assessed within a broader systems context, as well as being evaluated for specific entities and individuals within the system.

Capacity Development is a concept which is broader than institutional development since it includes an emphasis on the overall system, environment and context within which individuals, organisations and societies operate and interact. Even if the focus of concern is a specific capacity of an organization to perform a particular function, there must nevertheless always be a consideration of the overall policy environment and the coherence of specific actions with macro-level conditions. Capacity development does not, of course, imply that there is no capacity in existence; it also includes retaining and strengthening existing capacities of people and organisations to perform their tasks.

The OECD has defined Capacity Development as “... *the process by which individuals, groups, organisations, institutions and societies increase their abilities to: (i) perform core functions, solve problems, define and achieve objectives; and (ii) understand and deal with their development needs in a broad context and in a sustainable manner.*” This definition is adopted by various donors and is in accord with the UN definition of capacity above.

Taking the above approach, capacity is seen as a development outcome in itself and distinct from other programme outcomes such as building technical and professional competence in certain fields through HRD activities. Measures such as education and training become a means to an end while the end itself is the capacity to achieve the identified development objectives over time - such as to establish and maintain national land administration infrastructures for sustainable development (Enemark, 2002).

Levels and Dimensions of Capacity Building

The previous section defined the broad concept of capacity building. However capacity building is a much more complex activity than defined above. It can be viewed at different levels, with these levels including different dimensions (UNDP, 1998).

Capacity is the power/ability of something – a system, an organisation or a person to perform and produce properly. Capacity issues can then be addressed at these three levels. These levels relate to their application of capacity in society and have been identified as follows (UNDP, 1998):

1. The broader system/societal level.

The highest level within which capacity initiatives may be considered is the system or enabling environment level. For development initiatives that are national in context, the system would cover the entire country or society and all subcomponents that are involved. For initiatives at a sectoral level, the system would include only those components that are relevant.

The dimensions of capacity at a systems level may include areas such as policies, legal/regulatory framework, management and accountability perspectives, and the resources available.

2. The entity/organisational level.

An entity may be a formal organisation such as government or one of its departments or agencies, a private sector operation, or an informal organisation such as a community based or volunteer organisation. At this level, successful approaches to capacity building include the role of the entity within the system, and the interaction with other entities, stakeholders, and clients.

The dimensions of capacity at the entity level may include areas such as mission and strategy, culture and competencies, processes, resources (human, financial and information resources), and infrastructure.

3. The group of people/individual level.

This level addresses the need for individuals to function efficiently and effectively within the entity and within the broader system. Human Resource Development (HRD) is about assessing the capacity needs of people and addressing the gaps through adequate measures of education and training. Capacity assessment and development at this third level is considered the most critical.

The dimension of capacity at the individual level should include the design of educational and training programs and courses to meet the identified gaps within the skills base and to provide the appropriate number of number of qualified staff to operate the systems.

Strategies for capacity assessment and development can be focused on any level, but it is crucial that strategies are formulated on the basis of a sound analysis of all relevant dimensions. Often capacity issues are first addressed at the organisational level. Organisational capacity (such as capacity of SDI coordinating agency or jurisdictional infrastructure) is, however, influenced by not only the internal structures, systems and procedures, but also by the collective capabilities of its staff on the one hand, as well as by external factors in the wider institutional environment – such as the policy framework, and other political, economic and cultural factors – on the other hand. These may constrain or support performance and influence issues of organisational credibility, efficiency, and legitimacy. By taking this approach, capacity building measures can be addressed in a more comprehensive societal context.

It should be noted that the entry point for capacity analysis and development may vary according to the major focus of the project. However, it is important to understand that capacity building is not a linear process. Whatever is the entry point and whatever is the issue currently in focus, there may be a need to zoom in or zoom out in order to look at the conditions and consequences at the upper or lower level(s). Capacity building should be seen as a comprehensive methodology aiming to provide a sustainable outcome through assessing and addressing a whole range of relevant issues and their interrelationships.

SPATIAL DATA INFRASTRUCTURES

The evolution of the SDI concept has paralleled the development of complete digital spatial datasets in jurisdictions. As a result of the availability of jurisdictional-wide spatial data and the many opportunities this presents to both the government and private sectors, the institutional, legal and technical arrangements to support and facilitate the use of this spatial data have been re-engineered. One result highlighted over the last decade has been the evolution of the SDI concept.

This raises an interesting issue as to what constitutes an SDI in a developing country since no developing country has a jurisdiction wide Information and Communications Technology (ICT) infrastructure, without even considering a range of jurisdiction wide spatial data sets. There is no doubt that the concept has gained considerable support in the developed world but there is still considerable research needed before a clear view and justification is available for developing countries. While the justification in developing countries appears obvious, the reality is that SDIs are simply not on the development agenda of many developing countries. This would appear to be a challenge for the UN sponsored Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) and the UN Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP).

Originally the focus of SDIs was on the type, the development of and access to the various spatial datasets. As the concept has evolved it has expanded to include a focus on people, access, policies and standards in relation to the data, as well as adopting a shift in emphasis from what can be called a “product-based” approach to a “process-based” approach in SDI development (Rajabifard *et al*, 2002).

At the same time there is now a greater understanding of the role of SDIs in society and the contribution they make to a state or country. There is now an acceptance or at least a level of understanding in the governments in the developed world that an effective SDI is critical if the broader objectives of economic development, social justice and environmental management are to be achieved.

Discussion of the SDI concept also initially focussed on nations as an entity, while the last few years have seen more attention given to understanding the SDI hierarchy, from the local government level, through to state, national, regional and global levels. In general the various levels in the SDI hierarchy are a function of scale with the local government and state level SDIs usually concerned with large (1:5,000) and medium (1:25,000) scale data, whereas National SDIs tend to be small scale (1:25,000-1:100,000) with regional and Global SDIs adopting the scale of the global map of the world (1:1,000,000).

With an improved understanding of the SDI hierarchy has come the challenge to improve the relationships between SDIs in different jurisdictions as well as between different spatial data initiatives. The key to building successful SDIs is in the establishment of these relationships, especially through mutually beneficial partnerships, which are both inter- and intra-jurisdictional within the SDI hierarchy.

What is certain is that in the foreseeable future the SDI concept will continue to develop to a large degree in parallel with the evolution of information technology and the mainstreaming of sustainable development objectives in government policies.

SDIs are allowing spatial information to be integrated and accessible within a complex digital environment and in so doing are increasingly underpinning the relationship of humankind to land, and the management of natural resources and the marine environment by enabling spatial information to support planning and decision-making. SDI is an initiative intended to create an environment in which all stakeholders can co-operate with each other and interact with technology, to better achieve their objectives at different political and administrative levels. In simple terms SDIs facilitate the sharing of data. By avoiding duplication associated with generation and maintenance of data and integration with other datasets, and facilitating integration and development of innovative business applications, SDIs can produce significant human and resource savings and returns.

SDIs have thus become important in determining the way in which spatial data are used throughout an organization, a state, a nation, different regions and the world resulting in the consequent development of the SDI concept at different political and administrative levels and the development of the SDI hierarchy.

For a comprehensive review of SDIs see the forthcoming book titled “Developing Spatial Data Infrastructures – From concept to reality” (Williamson *et al*, 2003).

BUILDING CAPACITY FOR SDI: AN AUSTRALIAN CASE STUDY

The spatial data infrastructure concept continues to evolve as it becomes a core infrastructure supporting economic development, environmental management and social stability in developed countries and increasingly developing countries. Due to its dynamic and complex nature it is still a fuzzy concept to many, with practitioners, researchers and governments adopting different perspectives depending on their needs and circumstances. At the same time capacity building is also a complex issue with the term capacity having many different meanings and interpretations depending on who uses it and in what context it is used.

Therefore it is understandable that the development of appropriate strategies for capacity building for SDIs is unclear due to the application of a complex and unclear process to a fuzzy concept! As a result the best way to understand the application of capacity building to SDIs is to look at a case study. In this regard the capacity building activities in response to the needs of Australia and the region and particularly those of the Department of Geomatics and Centre of SDIs and Land Administration at The University of Melbourne, are discussed. These activities are considered in the context of the three levels (and related dimensions) of capacity building as illustrated in Figure 1: the broader system/societal level; the entity/organisational level; and the group of people/individual level.

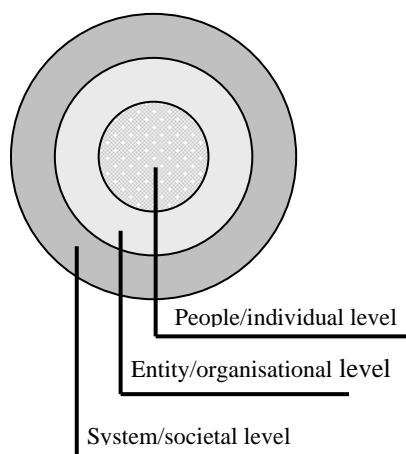


Figure 1: Three levels of capacity building

The capacity building concept discussed earlier identifies two components; *capacity assessment* and *capacity building*.

Capacity assessment is a diagnosis of the need and justification for capacity building. With regard to SDIs, the need for capacity building has been encouraged and justified by a wide range of initiatives, particularly over the last five years or so. Some of these are discussed below:

1. Australian Spatial Information Industry Action Agenda (<http://www.anzlic.org.au/pubinfo/2358011765>)
2. Challenges identified by the SDI Standing Committee of the Australian and New Zealand land Information Council (ANZLIC) http://www.anzlic.org.au/infrastructure_ASDI.html
3. The significance of the Prime Minister of Australia identifying *geo-informatics* as one of four frontier technologies as part of his announcement of Australia's National Research Priorities in December, 2002 (http://www.pm.gov.au/news/media_releases/2002/media_release2018.htm)
4. The issues identified by the Victorian Spatial Information Strategy www.land.vic.gov.au
5. The issues identified by the industry advisory body to the Victorian Government (GIRG) http://www.land.vic.gov.au/web/root/domino/cm_da/lnlc2.nsf/frameset/spatial

The need for SDI capacity has been identified at the broader system and society level in Australia at both a state and national level. Australia has also recognised the need to support SDI capacity at the regional level for Asia and the Pacific. At the national level the needs are to

support defence, economic development, mineral exploration, environmental management and particularly the management of water rights. At the state level the needs are similar but are larger scale and focus more on human activity and resulting land management and land administration. As a result a range of policies, institutions, organisations, laws and strategies have been created or developed in order to provide the capacity for the jurisdiction to support SDI and related spatial information activities.

The need for SDI capacity at the entity or organisational level has again focussed on state and national levels as well as at a Federal Government level. There has been an ongoing review of the capacity of the entities or organisations which build and manage SDIs at all these levels by many government reviews, committees and even Royal Commissions investigating and reporting on this need for over 200 years. As a result these organisations have a whole range of policies, data, standards, access arrangements and people to provide the capacity to deliver the SDI vision.

The need for SDI capacity at the individual level has received considerable attention in recent years but not nearly as much as at the organisational level. The result has been a wide range of education, training and research initiatives.

In summary Australia can be reasonably satisfied of ongoing SDI capacity assessment across the broader system, organisation and individual levels as discussed below.

The Broader System/Societal Level

At a national level Australia has responded to the need for SDI capacity at political and institutional levels. At the political level, there is support for a spatially enabled society as shown by the statement by the Prime Minister, the support for the Australian Spatial Information Industry Action Agenda, the awarding of an \$80 million research grant in the spatial information area and a commitment to support SDI research. Support is evidenced at a national and Federal Government level by a whole range of initiatives and organisations such as the Australian and New Zealand Land Information Council (ANZLIC), the Public Sector Mapping Agencies (PSMA) Ltd, Geoscience Australia (www.agso.gov.au/) as well as professional bodies such as the Spatial Sciences Institute and the Australian Spatial Information Industry Association (ASIBA). Details about all these organisations and activities can be seen in the Report by Australia to this conference.

In a similar manner each state and territory in Australia has their range of institutions and strategies such as the Victorian Spatial Information Strategy (VSIS) and the industry advisory body GIRG mentioned above which provide the political, legal and institutional environment to support the growth and operation of SDI. There are also state or territory chapters of each of the national professional or industry bodies.

In simple terms, at national federal and state levels, institutions and strategies have been put in place to provide capacity for the creation, operation and management of SDIs.

The Entity/Organisational Level

The focus at the organisational level is on the data, policies, standards, access networks and people who provide the capacity for the respective organisation to provide its support for the SDI vision. These aspects are found at both state, federal and national levels in Australia. It is the components which provide the richest source of information about the development of SDIs in Australia, with this information found on a wide range of www sites. Again reference should also be made to the report from Australia at this conference for reference to these components.

The Group of People/Individual Level

Capacity development for SDI at the people or individual level includes a whole range of activities such as:

- short courses including online delivery
- components of university degree programs
- conferences, seminars and workshops
- research training (Masters degree and PhD students) ie training people to do SDI research
- preparation of books, articles and reports

Some examples of these undertaken through the University of Melbourne are listed below.

International Symposium on SDI

The Centre for Spatial Data Infrastructures and Land Administration, the University of Melbourne organised the International Symposium on SDIs (www.sli.unimelb.edu.au/SDI/) on the 19th and 20th November, 2001. Over 100 delegates from 15 countries attended the Symposium to discuss the issues and challenges facing SDI development. Practitioners presented reports detailing their experiences and achievements from local, state, national, regional and global SDI initiatives. Researchers from the Centre for SDIs and Land Administration, the University of Melbourne made a number of presentations on key research areas.

The Symposium enabled contact among, and international comparisons with, those working independently on similar SDI initiatives, who are facing similar problems, and are using similar or alternative approaches. It brought together key researchers and agencies in technology development, management information systems, sociology, and users and producers from the spatial data community. Through this interdisciplinary approach constructive criticism was sought of the methods used and results achieved in SDI development to date. As a result directions were drawn for extending research into priority areas for the future.

SDI Book

The diversity of perspectives on SDI development offers a rich variety of experiences from which to learn and an extensive resource to the broader SDI community when documented. Contributing to the process of documentation was one of the motivations for producing this SDI book (Williamson *et al*, 2003). The book aims to provide some clarity to the SDI concept by drawing on practitioners and researchers from different backgrounds and jurisdictions to document their understanding of SDI and to share their experiences in building and analysing SDI.

The aim of the book is to provide an introduction to the concepts, organizational models and progress made on SDI developments and the cross-jurisdictional relationships of these developments, for those participating in and managing SDI implementation. The book is designed to be an educational and professional resource to help build information resource management capacity for the spatial industry in the context of SDI. Although directed at spatial scientists, technologists, professionals, managers, policy makers, students and researchers, it will have broader applications for other disciplines as the concept of SDI continues to adapt in response to user needs. As summarised below, the book is divided into six parts with each comprising a number of chapters.

Part One – Introduction and Background

Part Two – From Global to Local SDI

Part Three – Australian Case Study from National to Local

Part Four – Supporting Economic, Environmental and Social Objectives

Part Five – Technical Dimensions

Part Six – Future Directions

The SDI book built on a number of previous initiatives which have focussed on the concept and development of SDIs and the sharing of development experiences. The latter has included an increasing number of conferences on SDIs, with the leading forums being the Global Spatial Data Infrastructure (GSDI) conferences, United Nations Regional Cartographic Conferences, the meetings of the UN-sponsored Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) and such initiatives as the Digital Earth conference and the International Symposium on SDI which gave the initial impetus for the book. These forums form the basis of professional SDI development networks facilitating the exchange of experiences and the sharing of problems as well as opportunities, to look for solutions in the experiences of others in different jurisdictions.

SDI Short Course

Following successful completion of the SDI book, the Centre for SDIs and Land Administration has decided to design and conduct an SDI short course aimed at both the needs of Australia and the needs of countries in the Asia and Pacific region. The first course will be run 19-21 November, 2003 at the Department of Geomatics, the University of Melbourne. This course aims to deal with the main concepts of SDI, its nature and components, different SDI-aspects, spatial datasets (core datasets), data acquisition, SDI-technology and policy, SDI-use, standardisation and juridical issues and other related topics. This course has been designed partially based on a so-called problem-based learning environment in which participants are confronted with a series of SDI cases.

SDI components of Undergraduate and Graduate Courses

The Department of Geomatics at the University of Melbourne offers a range of degrees concerned with SDI but more broadly surveying, mapping, GIS, satellite positioning, remote sensing, land administration, cadastre for example (www.geom.unimelb.edu.au/). The main professional degree is the four year Bachelor of Geomatic Engineering with a three year Bachelor of Geographic Information Technology aimed at the GIS market. At the graduate level the Department offers the 12 month coursework Master of Geographic Information Technology as well as 6 month Certificate and 12 month Graduate Diploma degrees.

All these degrees have components concerned with designing, building and managing SDIs, such as the subject on Land Administration which can be taken at both undergraduate and graduate levels (www.geom.unimelb.edu.au/subjects/451/418/index.html).

SDI RESEARCH AND DEVELOPMENT

As in all technical disciplines, research and development is essential to the ongoing evolution of the technology and associated concepts. It is a critically important component of capacity building especially in an evolving discipline such as SDIs if it is to grow and reach its full potential. At this point in time, international research in SDIs is in its infancy with only a handful of universities around the world actively pursuing SDI research. While much of the research which supports the development of SDIs can be considered as being undertaken under many related discipline areas in the spatial information and land administration area, such as in data collection, positioning and geographic information science, specific SDI related research which has been identified in Australia includes:

- understanding, identifying and promoting the nature of SDI

- developing conceptual models of SDI within the SDI hierarchy
- comparing SDI initiatives to identify best practices
- investigating differences between the various levels in the SDI hierarchy
- investigating technical issues in support of SDI development and implementation including testing and evaluating prototypes
- technical issues concerned with interoperability and access
- data issues of privacy, intellectual property and security
- pricing policies and funding models
- statutory control of spatial data
- cultural and indigenous issues concerned with the establishment and maintenance of SDI
- establishment and integration of marine SDI within the SDI concept

While this is by no means a comprehensive coverage of the diverse range of challenges facing SDI development, it simply demonstrates some of the areas for research ranging from social and cultural dimensions, legal, policy and institutional considerations, through to technical issues and their intersection with the former. Nevertheless there is a whole range of issues which impact on the development of SDIs which need to be researched if the SDI concept is going to deliver its potential.

SDI research does not fall within just one of the capacity building levels. Remembering capacity building is the power of something – a system, an organisation or a person to perform and produce properly, research is being undertaken into capacity building for SDI at the system or societal level at both the state and national levels in Australia as well as being undertaken at the entity or organisational level, again at state and national levels. These areas comprise the vast majority of SDI research. Very little research is done at the people or individual level concerned with the ability of people to design, build or manage SDIs although this is a difficult area of research which would normally fall outside the skills of an SDI researcher.

SDI research is funded in Australia from a range of organisations. Both state and federal governments have provided substantial research funds for this area over almost a decade such as the funding from the Victorian and NSW State Governments and the Federal Government for research undertaken through the Centre for SDI and Land Administration at the University of Melbourne. At the same time the Australian Research Council (ARC) (the Australian national research body which provides peer reviewed research funds to university researchers) has also provided a range of grants over the years. Universities and the Federal Government also provide research scholarships with some of these going to SDI researchers. The recent CRC-SI will also provide significant funding for SDI research over the next seven years with funds coming from the government, educational and private sectors.

An example of a four year research project (2001-2004) funded jointly by the ARC and government partners focussed on the need to better understand the nature of SDIs and to be able to design the next generation of this form of infrastructure. Specifically the partners identified two technical problems within the broad SDI area that they believe need to be addressed if future SDIs are to be successful. The first concerns the development of methodologies to describe and map SDI's multi-dimensional capacity as an inter- and intra-jurisdictional spatial information framework. The second concerns the need to develop methodologies and GIS based algorithms, to improve administrative boundary design to enhance data integration and data exchange. Solutions to these problems will build on recent Diffusion and Hierarchical Reasoning (HR) research. Both these issues have been identified as problems with SDIs world-wide and as such the results of the research have generic application to other jurisdictions.

Two entities which are supporting SDI research are the Centre for SDIs and Land administration and the Cooperative Research Centre for Spatial Information (CRC-SI) described below.

Centre for SDIs and Land Administration

The Department of Geomatics, University of Melbourne has been undertaking research in Land Administration, and more recently in Spatial Data Infrastructures, for over a decade. However the last few years have seen a dramatic increase of interest in spatial data and land administration infrastructures at State and Federal levels in Australia and internationally. This resulted in the establishment of the Centre for Spatial Data Infrastructures and Land Administration Research in the Department of Geomatics in 2001. The close relationship between land administration and SDIs in a large-scale context at a state level was the driving force behind the establishment of the Centre. The Centre receives significant funding from the State Government of Victoria, due to the need to better understand the complex issues surrounding the role of spatial data in an information society with a focus on the role of SDIs and land administration.

This Centre comprises 15 full-time researchers with strong linkages to the State governments of Victoria and New South Wales, the Federal Government, the United Nations, The World Bank and several universities and foreign governments.

The Centre provides a focus for research in Spatial Data Infrastructures and Land Administration by building on ongoing research relationships and creating new links through extended collaboration both nationally and internationally.

Cooperative Research Centre for Spatial Information (CRC-SI)

Cooperative Research Centres (CRCs) are long-term collaborative ventures between researchers from universities and other government research agencies, and private industry or public sector research users, which support research, development and education activities of national economic or social significance. CRCs are selected through a competitive process, with successful bids receiving substantial funding from the Commonwealth Government for seven years.

The need for a CRC was specially identified in the Spatial Information Action Agenda as critical to the implementation of the Agenda. As a result, key elements of the Australian spatial information community provided a model of how the academic, government and commercial sectors are collaborating within the ASDI context through the establishment of a 'CRC for Spatial Information' (CRC-SI) in 2002 (www.spatialinfocrc.org). The core partners comprised spatial information agencies from the Commonwealth and three state governments (Victoria, New South Wales and Western Australia), three universities (Melbourne, New South Wales and Curtin), and a consortium of 43 private sector companies. The CRC-SI operates from five centres around Australia.

The CRC-SI supports national research priorities and enhances the outcomes of many others CRCs in Australia which rely on spatial data and related science and technology. The importance of spatial information was identified in December 2002 when the Prime Minister of Australia announced the National Research Priorities. As part of the National Research Priorities he identified frontier technologies for building and transforming Australian industries. He specifically stated “frontier technologies for building and transforming Australian industries is about fostering creativity and innovation by supporting leading edge research in areas such as information and communication technology (ICT), bio- and geo-informatics, nanotechnology and biotechnology ... Support for these areas of research will help stimulate vibrant new industries and ensure our future competitiveness”.

The identification of geo-informatics (for geomatics, geomatic engineering, GIS and spatial information science) alongside ICT, nanotechnology and biotechnology is an important recognition of the role that spatial information will play in the development of Australia.

The objectives of the CRC-SI include a close involvement of spatial information users in research activities, stronger collaboration between industry academic and government

researchers and research users, development of a long-term research agenda for spatial information, more efficient research training, and enhanced commercialization of spatial information technologies. The research program includes spatial information technologies, decision support systems and spatial data infrastructures. The central theme is to develop a 'virtual Australia' by uniting research and commercial innovation in spatial information technologies. The CRC-SI will greatly strengthen the research base for ASDI development.

THE NEED FOR SUSTAINABILITY AND CONTINUITY

A major problem in most institution building projects, particularly in developing countries, is that the focus is on the project as such, while the sustainability of the system in the longer term is only sporadically addressed within the project. For projects which involve establishing land administration systems and SDIs there is need to ensure sustainability and continuity, and to develop a corporate memory of experience within the country.

It is accepted that appropriately educated personnel and human resource development (HRD) are the keys to sustainability of institutional building projects. In achieving this objective it is essential to build up resources to support an ongoing HRD strategy and corporate knowledge in the discipline. At the same time it is important that a balance is achieved between tertiary education and technical education. Usually technical education is best undertaken by the implementing agency or government technical institutes, while objective policy and technical research and education is better undertaken at a university level.

The authors believe that most land administration projects and the essential SDI components would benefit from establishing a National Education and Research Centre in Land Administration as part of any major national land administration reform strategy or project in a developing country. The Centre could act as a repository of knowledge and experience in land administration (and SDI) in the country. The Centre would use the actual project as a long-term case study and operational laboratory. The Centre could provide educational programs and supervise the establishment of educational programs at other institutions in the country. The Centre could interact with international academics and professional bodies to assist the development of local academics. Such a Centre would most likely be established in an appropriate national university, possibly the lead academic department being in surveying/geomatics, but in conjunction with law, planning, valuation, sociology, anthropology and public policy departments, where appropriate.

The establishment of a Centre in a university could also capitalise on the independence and transparency which universities can provide. It is recognised that sometimes this independence can lead to some tension with government and needs to be managed, but the other option of having no university knowledge base or independent input to projects can lead to a far worse scenario.

While there is a commitment to HRD in all international organisations such as The World Bank, United Nations agencies and individual country development assistance organisations, the reality is that many efforts have only been marginally successful. Typically the major HRD focus in a land administration project is that significant numbers of government officials are sent overseas to do masters degrees, study tours are undertaken by senior government officials and some technical support is given to the responsible government departments. Unfortunately many major land administration reform projects leave little in the way of an ongoing in-country knowledge base.

The authors believe that the only way to adequately address human resource development (HRD) in support of long-term sustainability of land administration and SDI projects is to establish a long-term commitment to education and research within a university in the host country. This commitment to HRD should not be seen as an add-on to a project but a central and mainstream component of the project and should be funded at least for the duration of the project.

CONCLUSIONS

The main objective of this paper is to apply the concepts of capacity building to support and maintain SDI development initiatives. The paper initially develops a conceptual framework to better understand the capacity building concept. The concept recognises that capacity building comprises capacity assessment and capacity development.

While it is accepted that the SDI concept is still evolving and is unclear to many, and that the capacity building concept is similarly complex and having different interpretations, this paper has attempted to provide some clarity by examining SDI capacity building initiatives in Australia. Hopefully this case study will provide clarity to the levels and dimensions of SDI capacity building.

However the paper recognises that the above description of capacity building for SDI is considered primarily in the context of a developed country. As a result the paper also poses the question of what constitutes an SDI in developing countries while not attempting to provide an answer. The authors believe this is an important challenge for PCGIAP if the SDI concept is to be universally accepted, adopted and to reach its potential.

Whatever the outcome, one thing is certain, and that is that without a commitment to capacity building at all levels in support of SDI development, the SDI vision will remain unclear and unachievable, especially in developing countries. A challenge is for PCGIAP to apply these three levels of capacity building framework to the development of SDI in the countries in the Asia and the Pacific region.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of the UNFAO, Land Victoria (Government of Victoria), Aalborg University and the Centre for Spatial Data Infrastructures and Land Administration, University of Melbourne in the preparation of this paper. However, the views expressed in the paper are those of the authors and do not necessarily reflect the views of the institutions that supported the preparation.

The authors acknowledge that this paper draws on the concepts proposed in the paper titled "Capacity Building in Land Administration – A Conceptual Approach" by Stig Enemark and Ian Williamson which has been submitted to the Journal of Land Use Policy.

References:

- Enemark, S. and Williamson, I.P. (2003). Capacity Building in Land Administration – A Conceptual Approach. Submitted to the Journal of Land Use Policy.
- Enemark, S. (2002). Strengthening Institutional Capacity in Land Administration - Towards Developing Methodological Guidelines. Proceedings of FAO Workshop, The Land Tenure Service, Rome, 14-15 November 2002.
- Groot, Richard and Paul van der Molen, Eds. (2000). Workshop on Capacity Building in Land Administration for Developing Countries – Final Report. ITC, Enchede, The Netherlands, 12-15 November 2000.
- Rajabifard, A., Feeney, M.E.F. and Williamson, I.P. (2002) Future Directions for SDI Development. International Journal of Applied Earth Observation and Geoinformation, 4, 11-22.
- UNDP (1998). Capacity Assessment and Development. Technical Advisory Paper No.3. <http://magnet.undp.org/Docs/cap/CAPTECH3.htm> Accessed 13 April 2003.
- Williamson, I.P., Rajabifard, A. and Feeney, M-E. (2003). Developing Spatial Data Infrastructures – From concept to reality, Taylor and Francis, London.

Biographical Notes

Ian Williamson is Head, Department of Geomatics, University of Melbourne, Australia, where he is Professor in Surveying and Land Information, and Director of the Centre for Spatial Data Infrastructures and Land Administration. He is Chair, Working Group 3 (Cadastre) of the United Nations sponsored Permanent Committee for GIS Infrastructure for Asia and Pacific (PCGIAP). He was Chairman of Commission 7 (Cadastre and Land Management) of the International Federation of Surveyors (FIG) 1994-98 and Director, United Nations Liaison 1998-2002. His teaching and research interests are concerned with designing, building and managing land administration, cadastral, and land and geographic information systems in both developed and developing countries. He has consulted and published widely within these areas. <http://www.geom.unimelb.edu.au/people/ipw.html>

Abbas Rajabifard is Deputy Director of the Centre for Spatial Data Infrastructures and Land Administration, and a Research Fellow in the Department of Geomatics at the University of Melbourne. He holds BSurv (Theran), Postgrad-Dipl (ITC), MSc (ITC), and has recently received his PhD from the University of Melbourne. He worked for the National Cartographic Centre (NCC), Iran (1990-98), where he was the head of the GIS Department, managing the National Topographic Database and National GIS in Iran. He has been an Executive Board member and National representative to Permanent Committee on GIS Infrastructure for Asia and the Pacific 1994-1999, and member of International Steering Committee for Global Mapping 1997-2001.

<http://www.geom.unimelb.edu.au/people/staff/abbas.html>

Stig Enemark is Head of the School of Surveying and Planning School at Aalborg University, Denmark, where he is Professor in Land Management. He is Vice-President of the Danish Association of Chartered Surveyors. He was Chairman of Commission 2 (Professional Education) of the International Federation of Surveyors (FIG) 1994-98. He is an Honorary Member of FIG. His teaching and research interests are in the area of land administration systems, land management and spatial planning. He is particularly interested in project-organised education and the interaction between education, research and professional practice. He has consulted and published widely on these topics. <http://www.i4.auc.dk/enemark/>



Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Williamson, I. P.; Rajabifard, A.; Enemark, S.

Title:

Capacity Building for SDIs

Date:

2003

Citation:

Williamson, I. P. and Rajabifard, A. and Enemark, S. (2003) Capacity Building for SDIs , in Proceedings, of 16th United Nations Regional Cartographic, Okinawa, Japan.

Publication Status:

Published

Persistent Link:

<http://hdl.handle.net/11343/33869>

File Description:

Capacity Building for SDIs